

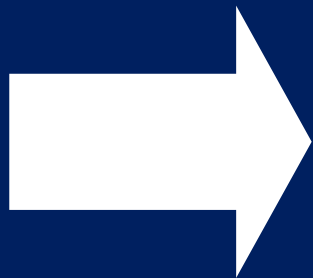
# **Acid discharge from the tropical peat swamp forest and its impact on local people – a review**

**Akira Haraguchi**

**Faculty of Environmental Engineering  
The University of Kitakyushu  
Japan  
[akhgc@env.kitakyu-u.ac.jp](mailto:akhgc@env.kitakyu-u.ac.jp)**

Land modification of peatland for bio-resource production causes many environmental problems.

Emission of green house gas

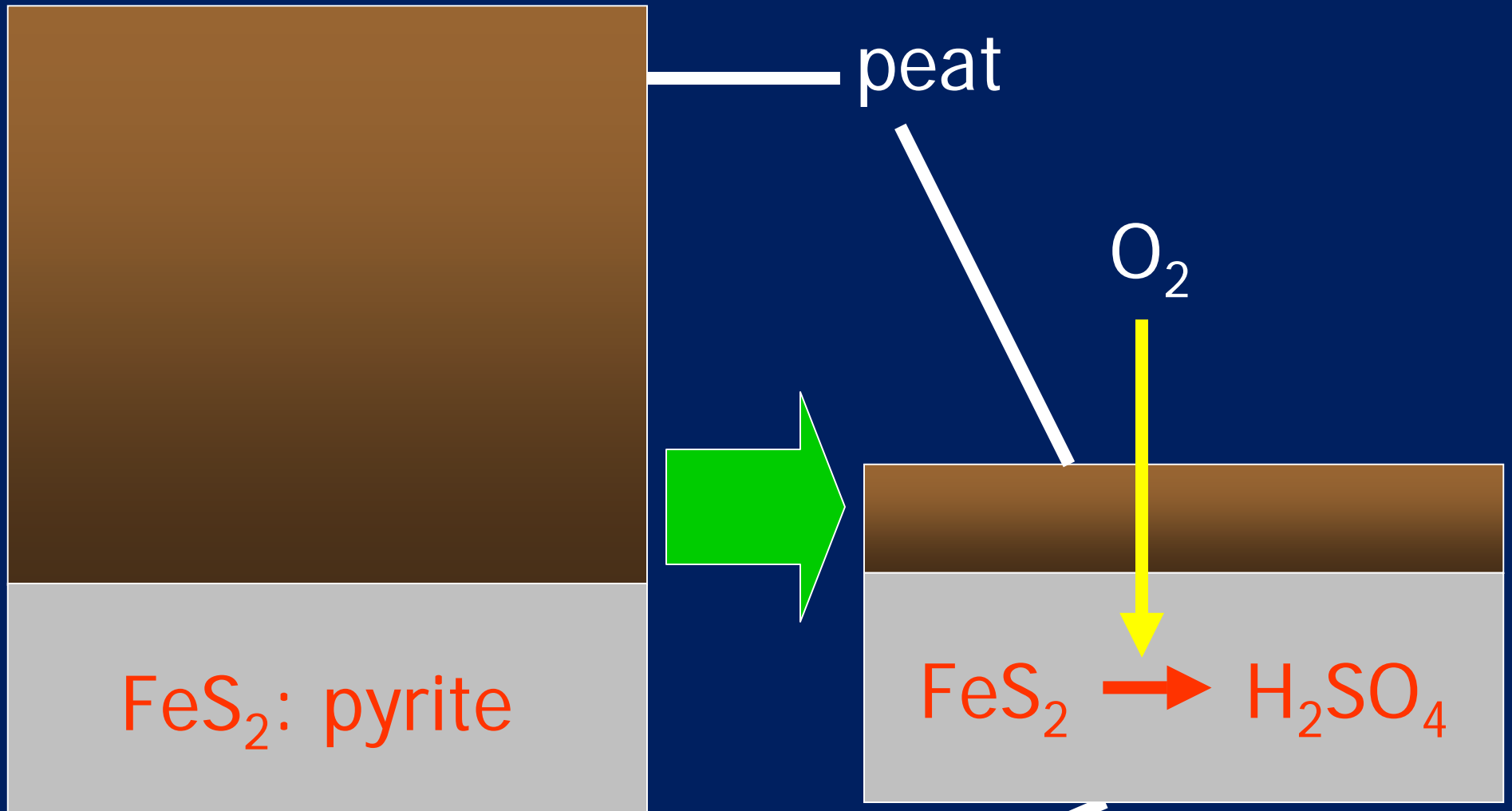


Forest fire

Erosion of soil

Acid sulfate soil

# Peatland near the coast



maritime sediment (reduced condition)

# Objective 1

Process of peat acidification by pyrite oxidation

## Method

Vertical profile of peat pore water chemistry were analyzed from upper to lower basin of rivers



Lahei

Palangkaraya

Setia Alam Jaya

Bakung

Rasau

Paduran

Sebangau River

Kahayan River

0 20 40 60  
km

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Pointer 2°39'11.71" S 114°09'30.79" E elev. 41 ft Streaming 100% Eye alt. 110.65 m

**Table** Chemical property (pH and  $\text{SO}_4^{2-}$  concentration) of peat pore water collected from peat cores in Central Kalimantan, Indonesia. Parts of the data appeared in Haraguchi et al. (2000).

		Location						
		Lahei 1	Lahei 2	Setia Alam Jaya	Bakung	Rasau	Paduran 1	Paduran 2
Basin		upper	upper	upper	middle	middle	lower	lower
Peat thickness (cm)		775	450	403	800	400	95	115
pH	Surface	3.48	3.73	3.70	5.51	3.88	3.60	3.56
	Bottom	5.42	4.59	3.77	5.02	4.44	3.47	3.31
$\text{SO}_4^{2-}$ (mg/L)	Surface	0.6	0.8	0.0	0.0	0.0	61.5	22.5
	Bottom	3.3	1.0	1.6	2.6	11.4	261.8	1626.0

## Objective 2

Estimate the range of polluted area by sulfuric acid in the fresh water ecosystem

### Methods

1. Surface river water chemistry at ca. 2.0 km interval in the study area
2. Sediment chemistry

Palangkaraya

Kya

Setia Alam Jaya

Bakung

Rasau

Bangah

Paduran

Sebangau River

Kahayan River

0 20 40 60  
km



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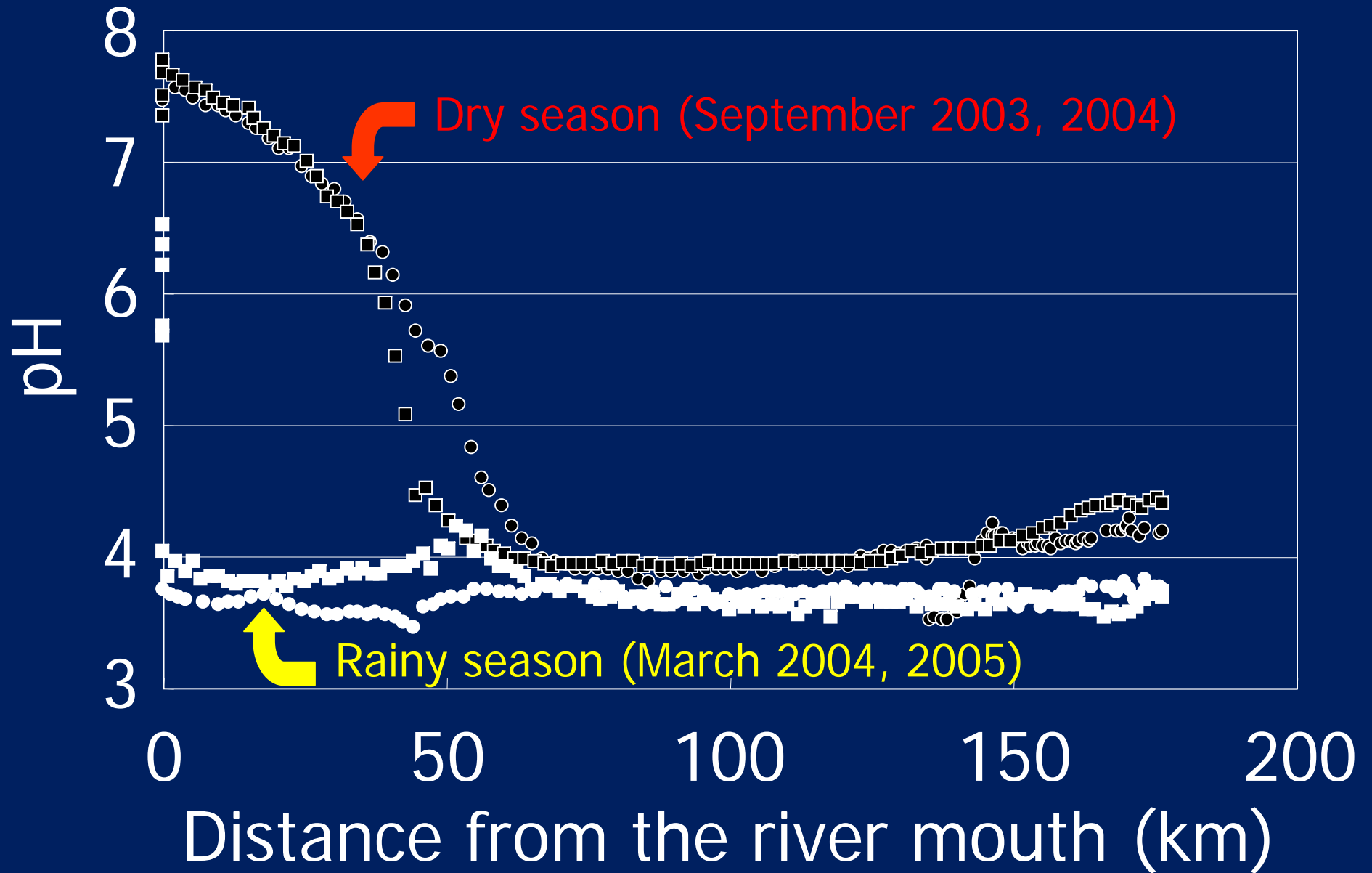
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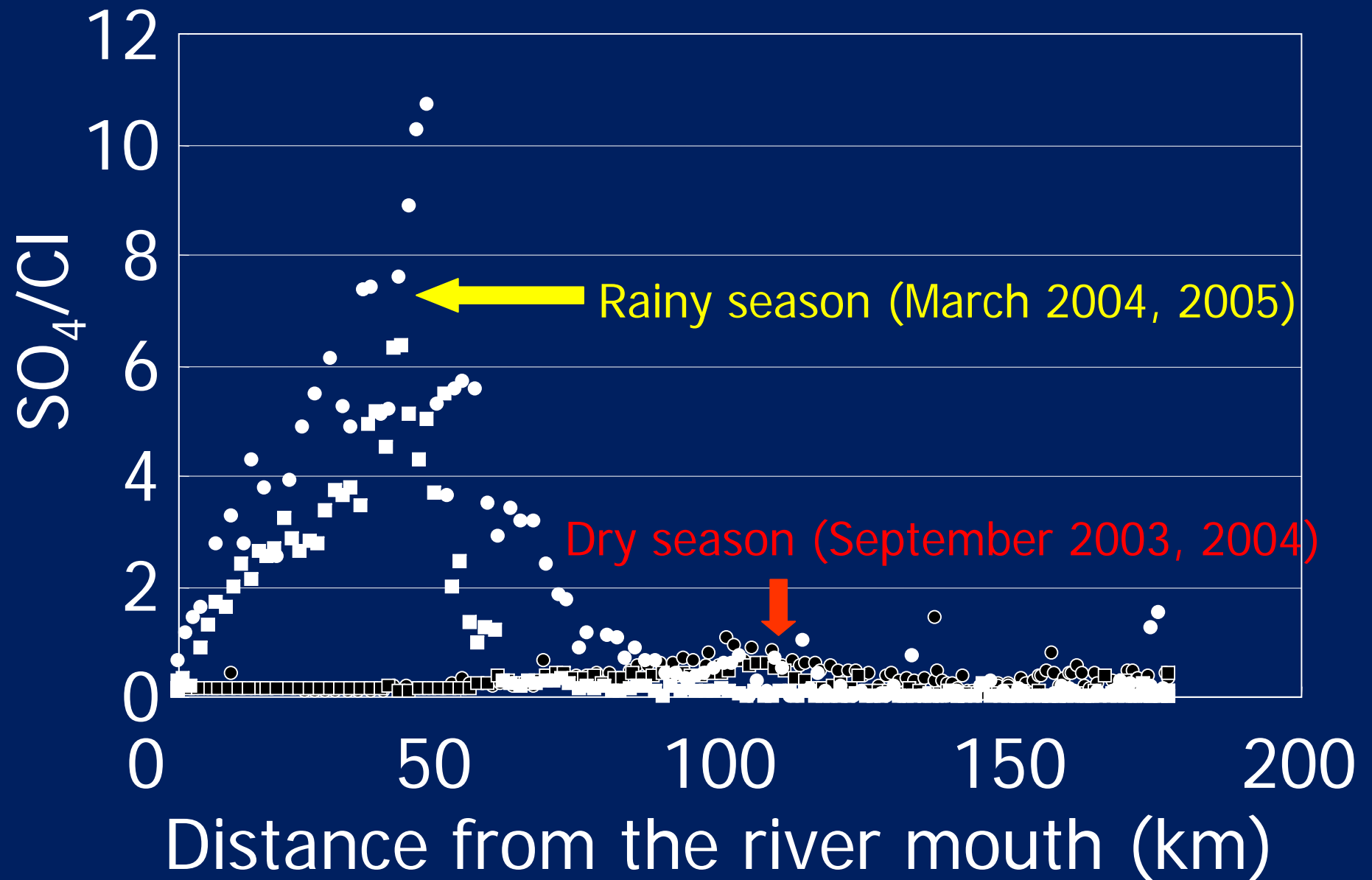
Streaming 100%

Eye alt. 110.65 m

# Sebangau River pH



# Sebangau River $\text{SO}_4 / \text{Cl}$ ratio



## C, H, N, S contents in sediments in Sg. Sebangau

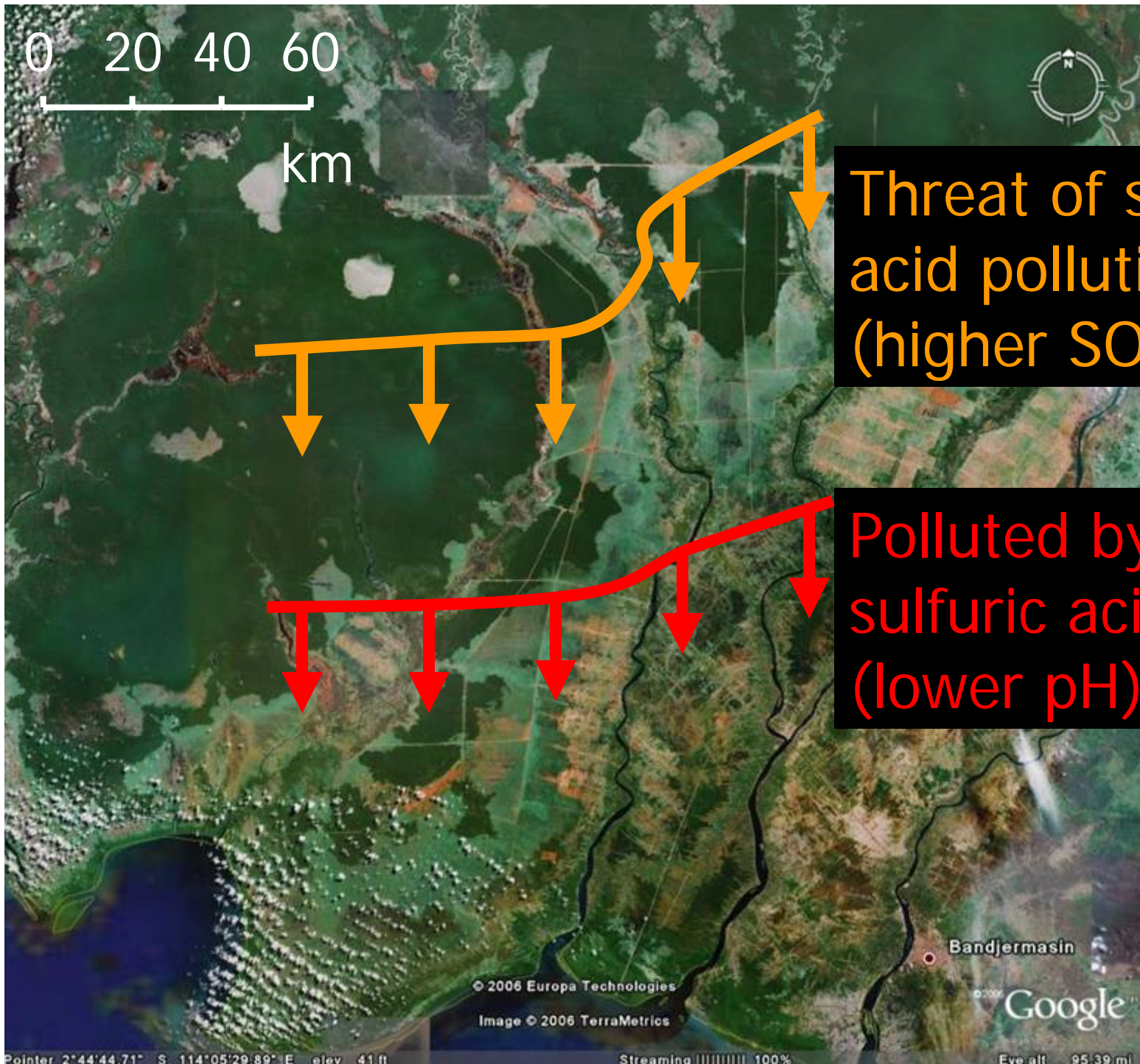
% (w/dry-w)	C	H	N	S
Kya	39.8	4.3	0.6	0.1
Rasau	48.3	4.9	0.9	
Bangah	32.5	3.7	0.5	0.3
Paduran River	17.9	2.6	0.4	0.1
Paduran Canal Mouth	14.6	2.2	0.2	0.3
Paduran Canal Mid	11.6	2.3	0.2	0.9
Sebangau Mouth	4.6	1.5	0.2	0.0

# X-ray fluorescence analysis of sediments in Sg. Sebangau

	Na <sub>2</sub> O	MgO	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	Cl	K <sub>2</sub> O	CaO	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	MnO
Kya	0.00	0.00	1.38	98.10	0.00	0.00	0.00	0.12	0.00	0.00	0.29	0.00
Rasau	0.00	0.00	12.90	72.60	0.00	7.60	0.00	1.77	0.78	0.00	4.39	0.00
Bangah	0.00	0.46	18.40	67.00	0.28	2.29	0.00	2.01	0.58	1.91	7.06	0.00
Paduran river	0.00	0.00	24.50	54.40	0.43	2.76	0.00	2.45	0.25	2.50	12.80	0.00
Paduran	0.00	1.67	24.80	51.60	0.27	1.05	0.31	2.29	0.47	0.00	17.30	0.00
River mouth	1.76	2.17	20.40	47.40	0.27	1.43	3.71	2.18	1.29	1.29	17.80	0.28

# Results

1. Lower basin of the river is highly polluted by sulfuric acid.
2. Contamination of chemicals due to pyrite oxidation in peat, water and sediment appeared whole area of the peat swamp forest.
3. Sulfuric acid discharges from peat to river mostly in the rainy season.



Threat of sulfuric acid pollution  
(higher  $\text{SO}_4/\text{Cl}$ )

Polluted by sulfuric acid  
(lower pH)

# Objective 3: Impact of sulfuric acid pollution on local people



pH < 2.0 !

What happens??

# Interview to local people

Objective:

Obtain the information on the utilization of water from local inhabitants in the basin polluted by sulfuric acid

Especially on:

(1) difference between polluted and non-polluted area

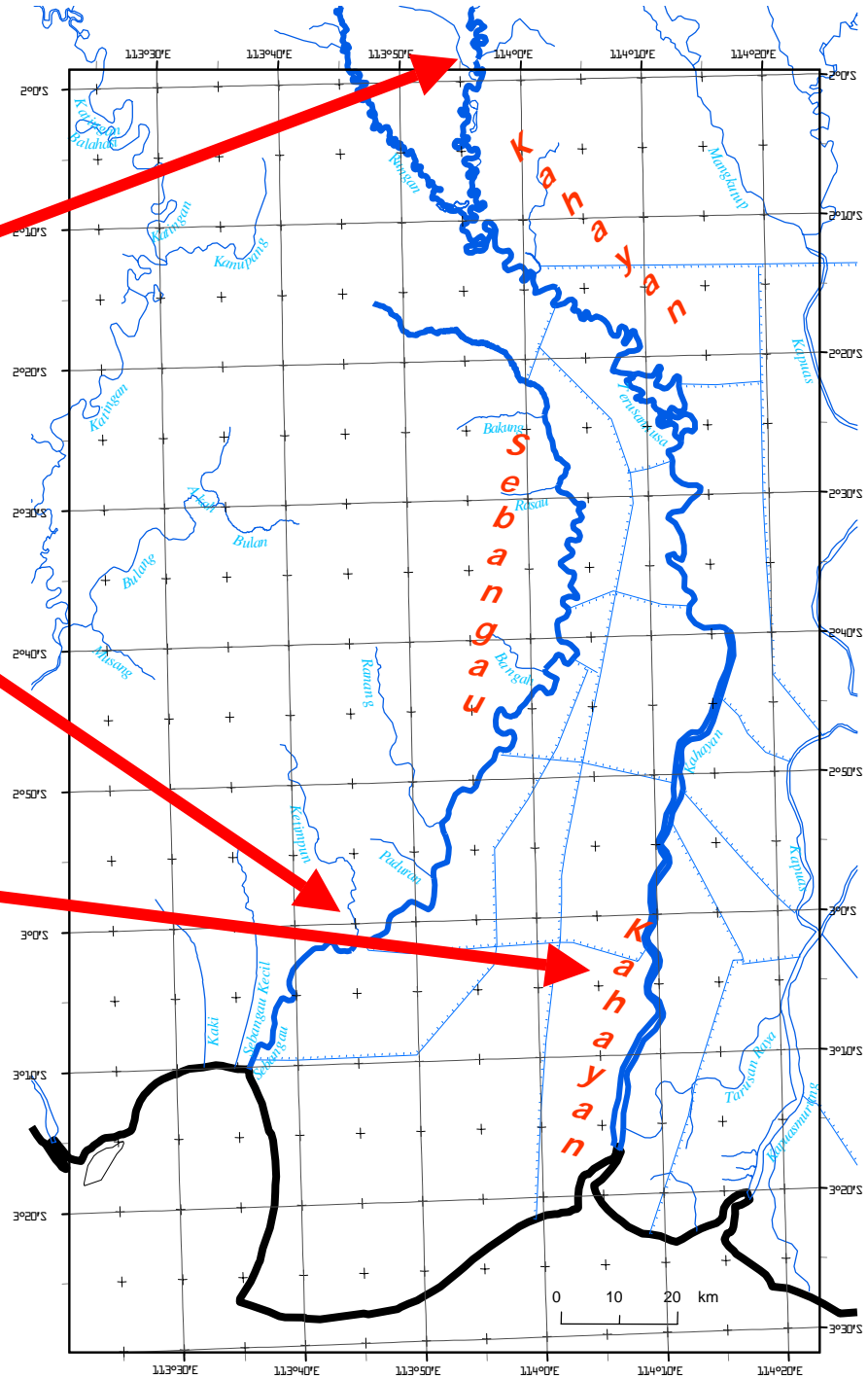
(2) difference between rainy and dry seasons

# Study sites

Sigi

Paduran

Pangkoh



# Interview to local people

Village	Area	Sample No.
Sigi (including Bukit Rawi, Bahu Palawa, Bukit Liti, Petuk Liti),	Middle basin of Kahayan	n = 52 (Dec. 2005)
Paduran	Lower basin of Sebangau	n = 33 (Dec. 2005) n = 36 (March 2006)
Pangkoh	Lower basin of Kahayan	n = 45 (March 2006)

**Question 1.** What kind of water are you usually using for the following purpose?

Purpose

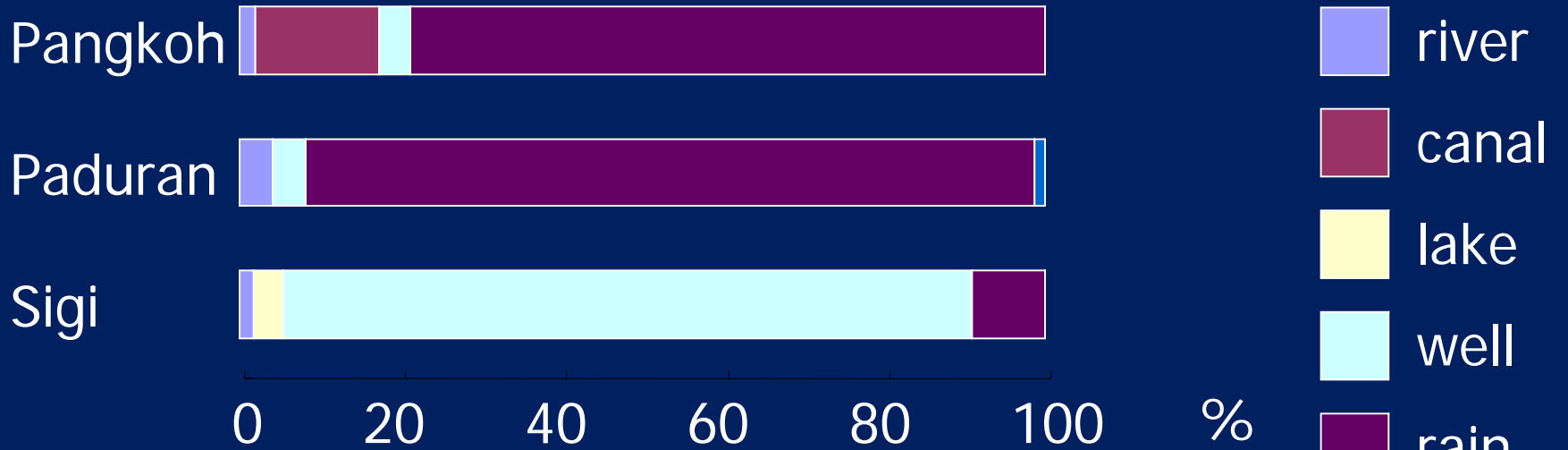
Drinking	Cooking	Washing mouth
Bath	Washing clothes	

Water type

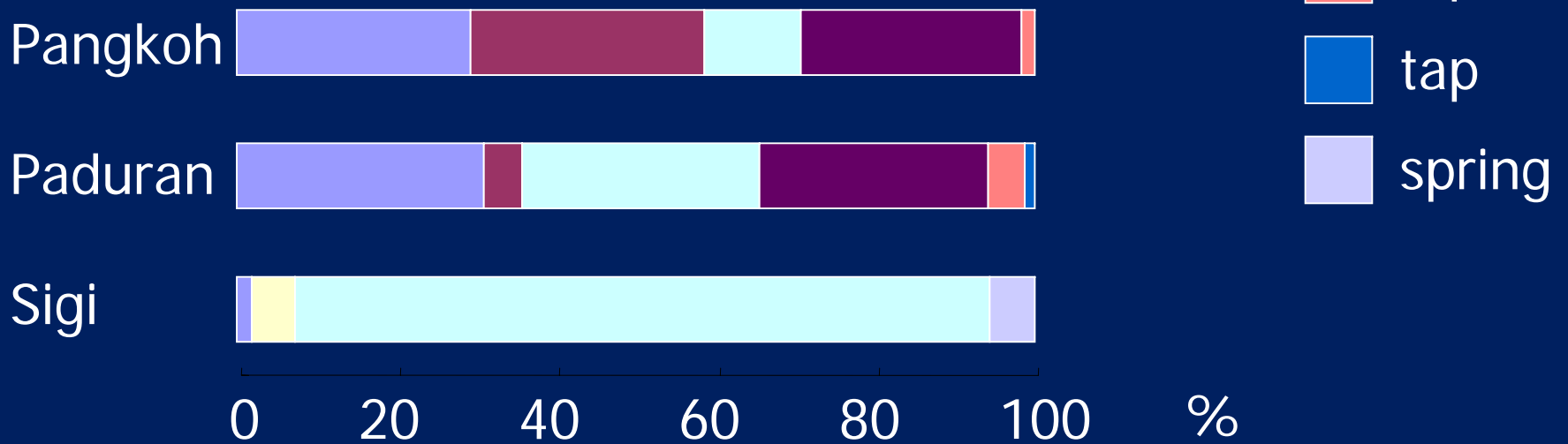
River	Canal	Lake
Well	Rain	RO water
Tap water	Spring	

# Air minum

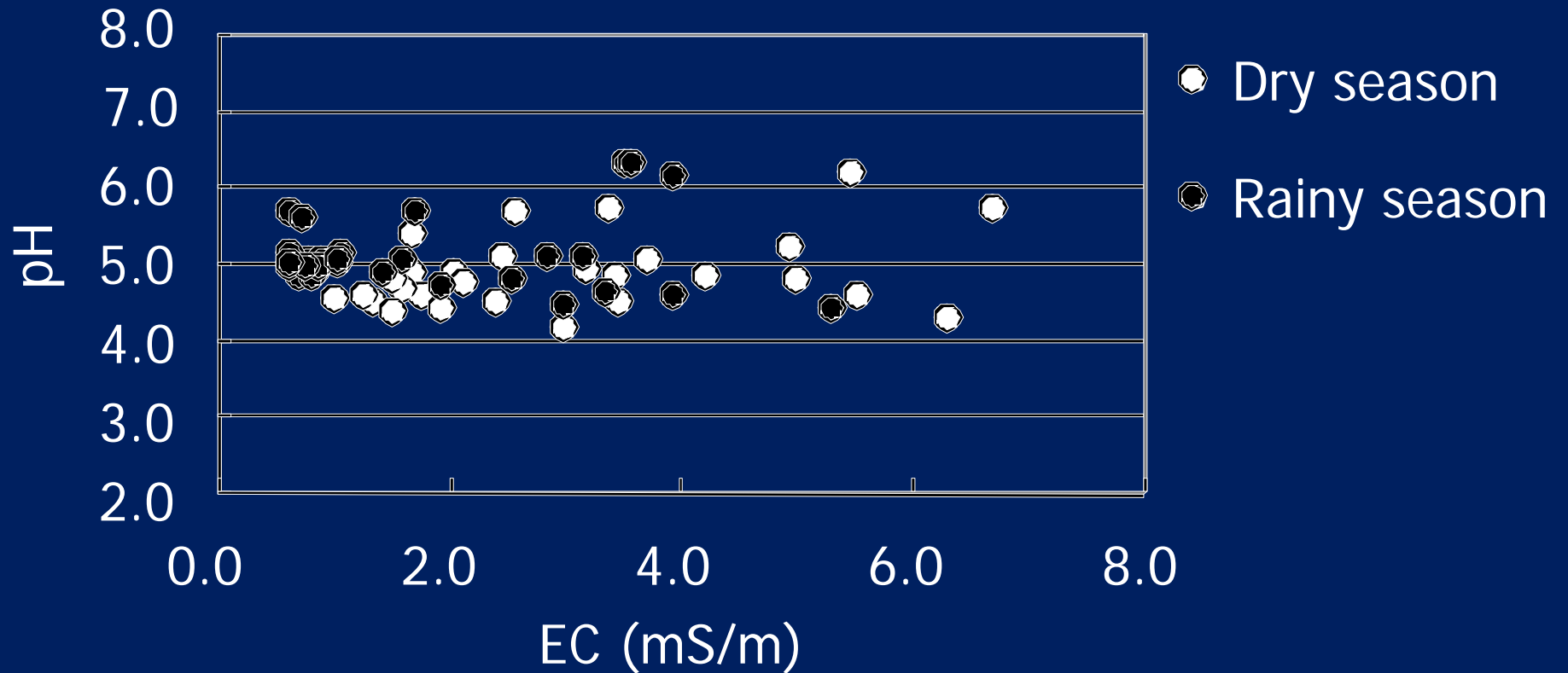
## rainy season



## dry season

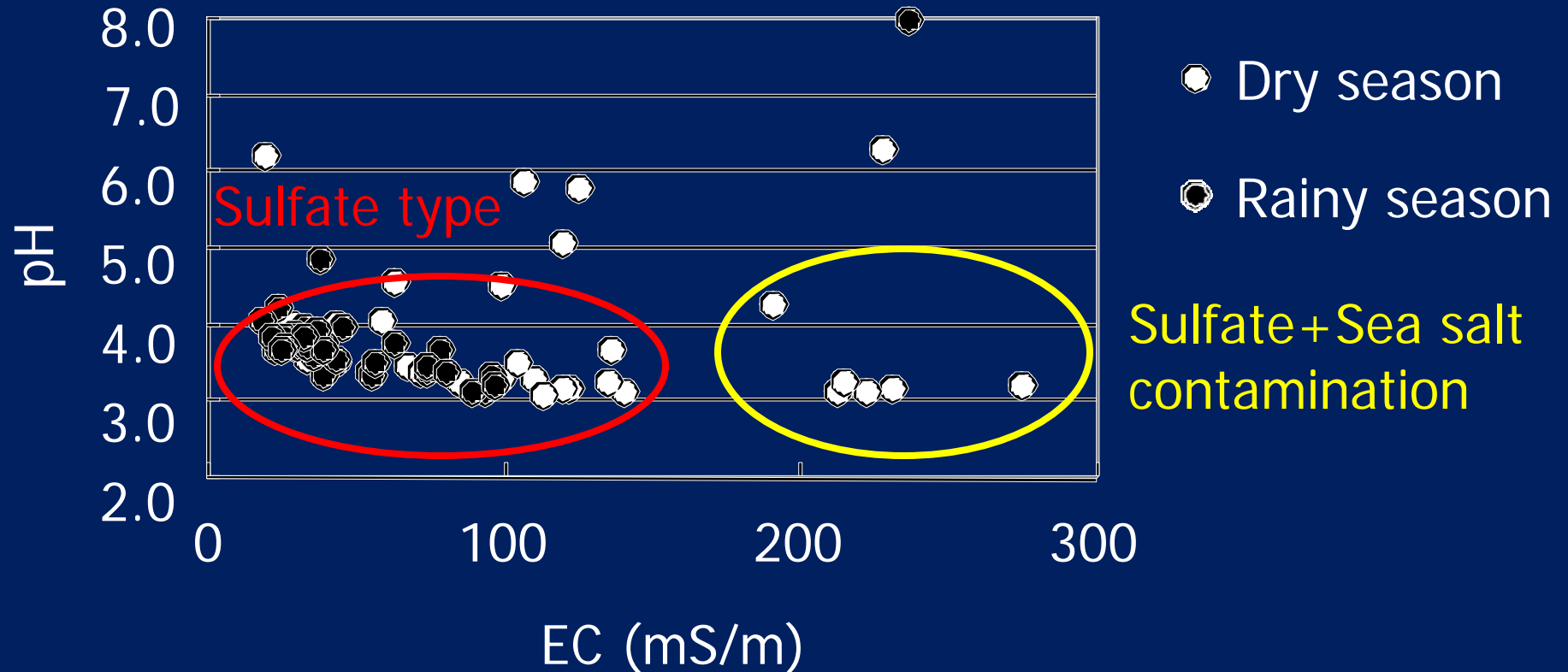


## Ground water in Sigi



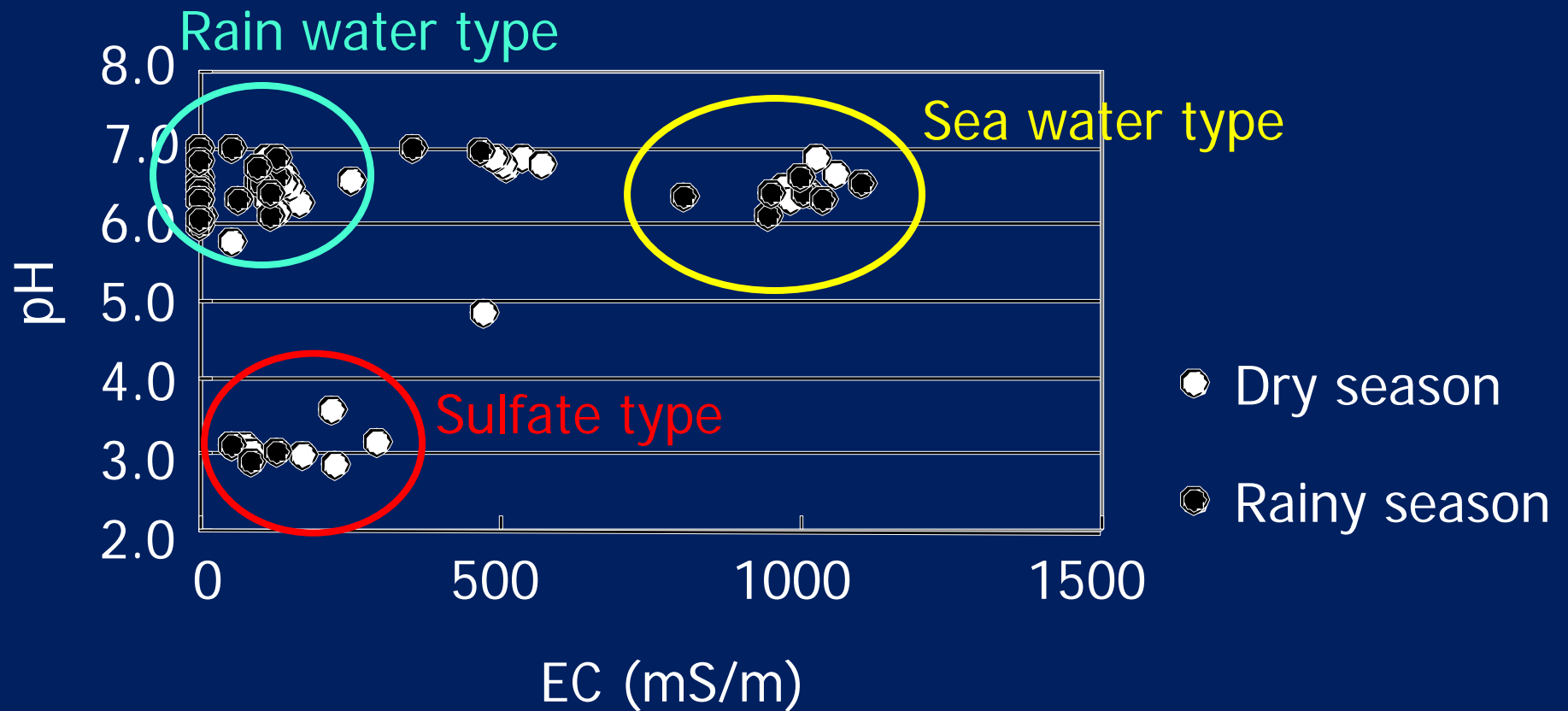
Constant low EC and pH = ca. 5.0  
= constantly available for drinking

## Ground water in Pangkoh



Always low pH and especially high EC due to sea salt contamination in the dry season = constantly not available for drinking

# Ground water in Paduran



Water quality depends on site  
= some are available but others are not  
available for drinking

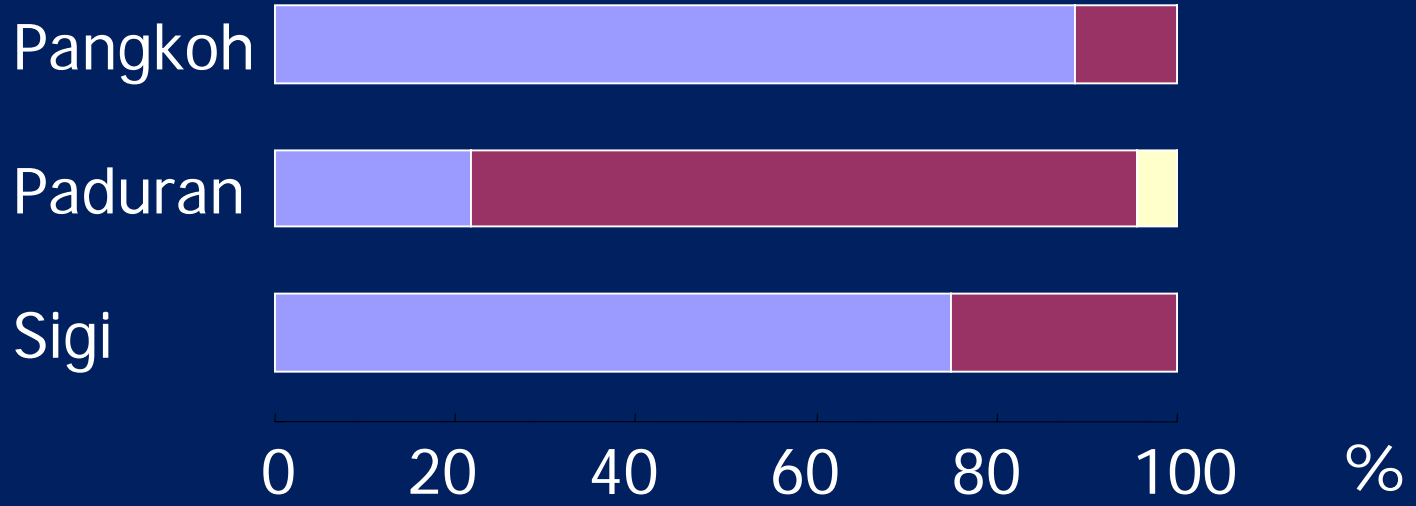
# Results

1. Local people select water type depending on water quality.
2. Ground water quality depends on area and site and usually not good water source in the lower basin of rivers.

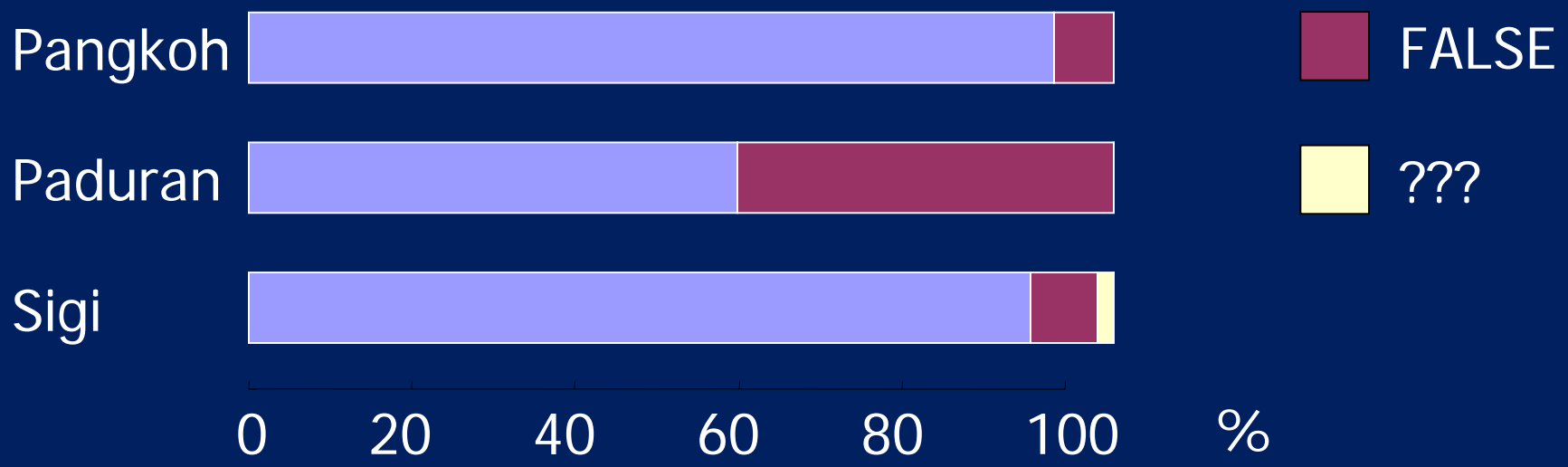
**Question 2.** Do you think the following statements true or false?

1. We can drink river or canal water after boiling
2. Swimming in the river is safe for the skin
3. Freshwater fish is safe for eating
4. Throwing away of rubbish to the river/canal will pollute the environment
5. The use of electric devices, chemical substances is dangerous for fish sustainability

# 1. We can drink river & canal water after boiling



# 2. We can swim in river & canal



# Results

1. Paduran people well know the risk of sulfuric acid pollution and adjust to the chemical property of water.
2. Pangkoh people are conscious about the seasonal difference of water quality of river & canal water. But they don't have enough knowledge on the risk of the pollution.

# Conclusion

1. Sulfuric acid contamination appears not only in the coastal peat swamp but also in the inland peat swamp.
2. Environmental education on water quality suited to each community (community level education) is important.